MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY

Permitting and Compliance Division
Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

Statement of Basis
Montana Ground Water Pollution Control System (MGWPCS)

Permittee:	Dave Rasmussen
Permit No.:	MTX000197
Receiving Water:	Class I Ground Water
Facility Information:	
Name	Stoney Brook Condominium Village
Location	NW, NE Section 23, Township 9 North, Range 3 West in Jefferson County at Stoney Brook Drive and Highway 282 in Montana City.
Facility Contact	Dave Rasmussen 19 Rock Ridge Drive Clancy, MT 59634-9730 Phone: (406)459-0914
Information:	
Number of Outfalls	One (1) for the purpose of fee determination
Outfall(s)/Type	001 - Subsurface Drainfields for Phases I, II, & III

I. PERMIT STATUS

This statement of basis is for the issuance of a new wastewater discharge permit for the Stoney Brook Condominium Village (SBCV) pursuant to the Montana Ground Water Pollution Control System (MGWPCS). The permittee, Dave Rasmussen submitted a permit application (Form 1 and GW-1) for the existing phases (I and II) of the development. The application was received by the Department on April 9, 2007, in accordance with ARM 17.30.1023(3) and (4). Fees were received on April 12, 2007. The permittee is currently operating Level II [ARM 17.30.702(11)] wastewater treatment systems [recirculating sand filters (RSFs)] for Phases I and II. A request for supplemental information [ARM 17.30.1023(5)] was made by the Department on May 1, 2007. A written response was received by the Department on May 18, 2007. The MGWPCS application was determined to be complete [ARM 17.30.1024(1)] on June 8, 2007, but with an extensive compliance schedule requiring additional hydrogeological information.

On June 10, 2008, the permittee submitted a revised GW-1 application with $200 for a minor modification. This application included the proposed wastewater treatment and disposal system for Phase III. Revised and updated hydrogeological data were provided for the entire site, which includes Phases I, II, and III. The proposed Phase III wastewater treatment system will provide Level II wastewater treatment via a RSF.

Based on the modified application submitted, a request for supplemental information was made by the Department on July 10, 2008. An addendum to the July 10, 2008 deficiency letter followed on July 23, 2008. A written response was received by the Department on September 12, 2008. The modified application was determined to be complete on October 1, 2008. This is a new source as defined in ARM 17.30.703(18), and is therefore subject to the Montana Nondegradation Policy (75-5-303, MCA) and the Administrative Rules (ARM 17.30.701, et seq.). SBCV will be permitted by the Department under 75-5-402(1), MCA.

The Public Water Supply Division has reviewed and approved two supply wells for the SBCV under MTPWS#0004257. The water supply system was activated on July 1, 2002. The SBCV is also subject to review and approval under the Montana Sanitation in Subdivision Act. The applicant submitted plans and specifications for review on December 26, 1996, and received a Certificate of Subdivision Plat Approval from the Department's Subdivision Section on June 20, 1997 (EQ#97-2044). Since the information required by subdivision law and regulation was not submitted within the statutory deadlines, a subdivision rewrite was required under EQ#07-2417. This rewrite was approved by the subdivision section on April 9, 2007, and included Phases I and II. The applicant has not submitted plans and specifications for review by the subdivision section for Phase III.

II. FACILITY INFORMATION

A. General Description

The SBCV is located 7.2 miles south of Helena. The property is situated between Highway 282 and Interstate 15, south of Montana City. The SBVCS is a retirement community that will consist of a total of 64 condominiums and one community center. Phase I and II consist of 44 existing and occupied units, plus the community center. Phase III is proposed and will consist of 20 condominiums.

B. Wastewater Collection, Treatment, and Disposal

The existing development is divided into two phases. The existing Phase I consists of 28 condominium-lots and one community center. Septic tanks (1,500-gallon) are shared between every two units. The community center will have one separate 1,500-gallon septic tank. Floatable and settleable solids are removed in the septic tanks. A collection system conveys the wastewater to a recirculation tank (14,475-gallon). From the recirculation tank, the wastewater goes to a recirculating sand filter (RSF) where it receives Level II treatment [ARM 17.30.702(11)]. The splitter valve is configured at a 4:1 ratio such that a minimum of four-fifths of the flow is returned to the recirculation tank and the remaining one-fifth is diverted to the Phase I pump tank for collection/storage. Effluent from the Phase I pump tank goes to one common dose tank for Phases I and II, which pressure-doses the 4-zone, gravel-trench subsurface drainfield (see Attachment 1 - Flow Line Schematic, and Table 1 – Design Information).

The existing Phase II consists of 16 condominium-lots with each 1,500-gallon septic tank being shared between every two units. Floatable and settleable solids are removed in the septic tanks. A collection system conveys the wastewater to a recirculation tank (9,935-gallon). From the recirculation tank, the wastewater goes to a recirculating sand filter (RSF) where it receives Level II treatment. The splitter valve is configured at a 4:1 ratio such that a minimum of four-fifths of the flow is returned to the recirculation tank and the remaining one-fifth is diverted to the Phase II pump tank for collection/storage. Effluent from the Phase II pump tank goes to one commondose tank for Phases I and II, which pressure-doses the 4-zone,

gravel-trench subsurface drainfield. The subsurface drainfield discharges to shallow ground water. The drainfield replacement area is interlaced.

AMCO 3-inch Class II turbine T3000 totalizing flow meters shall be located after each "pump tank" ("A" is for Phase I, & "B"is for Phase II, see Attachment 1), prior to the effluent entering the single dose tank that pressure-doses the 4-zone subsurface drainfield, which discharges to ground water.

The treatment system design for Phase I and II is based on a previous approval from the Department's Subdivision Section for a flow reduction of 273 gallons per day (gpd) per unit, plus 100 gpd for the community center. Therefore, the average design flow provided by the applicant for Phases I and II, and the community center is 12,112 gpd.

Table 1: Stoney Brook Condominium Village – Design Information for Existing Phases I & II	
Construction Date: Existing	Modification Date: June 10, 2008
Design Population: 44 condominium units	Estimated Population: 88
Design Flow, Per Unit (gpd): 273	Average Design Flow (gpd): 12,112
Disinfection (Y/N): No	Type: NA
Disposal Method: Subsurface Drainfield	
Effluent Flow Meter(s): 2 totalizing turbine flow meters (proposed)	
Sludge Pumping and Hauling: Helena Septic Pumping Service	Solid Waste License No.: S-951
Sludge Disposal: City of Helena Wastewater Treatment Plant	Discharge Permit No.: MT0022641

The proposed Phase III will consist of 20 condominium-lots. Level II treatment will be provided via a RSF. Phase III will have a pressure-dosing tank that discharges treated effluent to the Phase III subsurface drainfield. The drainfield will be located adjacent to (south-southwest) the existing drainfield that serves Phases I and II. A totalizing flow meter will be located following pump tank "C" and prior to the Phase III dose tank (see Attachment 2). Phase III is proposed to discharge at an average design flow of 6,000 gpd based on 300 gpd per unit.

Table 2: Stoney Brook Condominium Village - Design Information for Proposed Phase III	
Construction Date: Proposed	Modification Date: NA
Design Population: 20 condominium units	Estimated Population: 40
Design Flow, Per Unit (gpd): 300	Average Design Flow (gpd): 6,000
Disinfection (Y/N): No	Type: NA
Disposal Method: Subsurface Drainfield	
Effluent Flow Meter(s): 1 totalizing turbine flow meters (proposed)	
Sludge Pumping and Hauling: Helena Septic Pumping Service	Solid Waste License No.: S-951
Sludge Disposal: City of Helena Wastewater Treatment Plant	Discharge Permit No.: MT0022641

The proposed total average design flow is 18,112 gpd from Phases I, II, and III. As part of the general facility operations and maintenance plan, settled solids/sludge from the septic tanks, the recirculation tanks, and the RSF will be removed periodically as needed, no set maintenance schedule is proposed. The applicant proposes to remove sludge and dispose of it at the City of Helena Wastewater Treatment Plant (Permit No. MT0022641).

III. DESCRIPTION OF THE DISCHARGE

A. Outfall Location

The proposed permit authorizes the permittee to discharge residential strength wastewater from three RSF wastewater treatment systems to subsurface drainfields (Outfall 001).

- Outfall 001 is located approximately midway along the east property boundary and includes the existing subsurface drainfields for Phases I and II (includes the community center) and the area proposed for the subsurface drainfield for Phase III, which has not been constructed prior to the effective date of the final MGWPCS permit.

  - Dose Tank 001A is the effluent sampling location for existing Phases I and II.

  - Dose Tank 001B is the effluent sampling location for proposed Phase III.

B. Past Effluent Monitoring Data

The permittee has conducted two effluent sampling events from the existing wastewater treatment system for Phases I and II. The first sample was collected on May 2, 2006, from the dose tank ("discharge" tank) prior to discharge to the subsurface drainfield. The second effluent sample was collected on May 26, 2006, from one of the two "pump" tanks prior to the dose tank (see Attachment 1). Analytical results from these samples are provided in Table 3.

Table 3. Effluent Analytical Data from Phases I and II

	Parameters, mg/L				
Sample Collection Date:	**BOD**	**Nitrate + Nitrite, as N**	**Ammonia, as N**	**Total Kjeldahl Nitrogen (TKN)**	**Total Nitrogen, as N**
May 2, 2006 (dose tank)	ND	36.6	ND	6.37	42.9
May 26, 2006 ("pump tank")	5.06	12.6	9.70	12.8	25.4

ND = No data collected.

C. Effluent Characteristics

Phase III is a proposed site and the permittee has collected no wastewater samples for analysis. The effluent that is discharged from a typical RSF system to a subsurface drainfield is expected to have the following (see Table 4) average and/or range of chemical characteristics based on typical performance data compiled by USEPA (2002).

Table 4. Typical Effluent Characteristics for a Recirculating Sand Filter Wastewater Treatment System

Parameter, (units)	Average Value	Range	Reference
Biological Oxygen Demand (BOD), mg/L	6.3	3-10	USEPA (2002)
Total Suspended Solids (TSS), mg/L	6	3-9	USEPA (2002)
Total Kjeldahl Nitrogen (TKN), mg/L	3.6	1.1-7.9	USEPA (2002)
Total Nitrogen(1) (TN), mg/L	22.7	16-31.5	USEPA (2002)
Total Phosphorous (TP), mg/L	1.5	1-2	USEPA (2002), MDEQ Memo-Regensberger, 1998
E-Coli Bacteria, # of organisms/100ml	<1	10^1-10^4	USEPA (2002)

(1) Total Nitrogen (TN) = the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen (as N).

IV. SITE CHARACTERISTICS

A. Soils

The NRCS Soils Map (2007) of this area shows the northwest half of this property consists of "mine dumps" and has not been used for development. The majority of the southeast half of the property is composed of Clinton, Cometcrik, and Perma soils, which form on slopes of 0 to 15% and are generally described as stony. Shawmut, Stony-Martinsdale is a very stony complex that makes up soils found on slopes from 15 to 25% along the southeast property boundary. Along the northeast property boundary, slopes increase from 15 to 35%. Soils here, consist of the Maiden-Lap-Windham Complex.

Soils logged from five test holes (THs) that were dug in the area for the subsurface drainfields prior to construction for Phases I and II, describe coarse loamy sand comprising most of the surface and near-surface soils down to 4 feet below ground surface (bgs). In the subsoils from 4 to 12 feet bgs there is an increase in angular broken and blocky limestone-gravel with clay and cobbles. The diameter of the material increases from 1 to 6 inches, up to 3 to 24 inches. Depositional environments in the area (Phases I and II) of the drainfields range from alluvial (4 feet bgs) to colluvial (12 feet bgs in TH#3). No water was reported on the TH soil logs for Phases I and II.

The proposed Phase III subsurface drainfield will be located adjacent to (south-southwest) the existing Phase I and II drainfields. The topography of the proposed Phase III drainfield area was reportedly disturbed by historic placer mining operations. Therefore, the surface area has been leveled in anticipation of the proposed Phase III wastewater treatment site. This excavation work has lowered the elevation of the ground surface approximately 5 feet, such that it is now lower than the existing drainfields to the north-northeast. Soil descriptions provided from the six test pits dug in this area in April 2008, indicate sandy loam as deep as 11.5 feet bgs. The applicant as indicated there was backhoe refusal caused by fractured limestone at about 11 feet bgs. The permittee has proposed 2.5 feet as the depth to the base of the drainfield trenches, allowing 8.5 feet for potentially absorptive soils beneath the proposed Phase III drainfield.

B. Geology

Sediments in the vicinity of Prickly Pear Creek and the floodplain area are composed of a fine alluvium. On the steeper slopes, colluvial material associated with the weathered bedrock sediments (limestone chips and cobbles with a clay matrix) are present. Shallow bedrock in this area consists of fractured limestone.

C. Hydrogeology

Ground water monitoring well, MW-1 was installed in 1996. It is located approximately 135 feet north of the north side of the existing subsurface drainfield area. During drilling moist subsoil was encountered from 10 to 25 feet bgs in limestone cobbles and clay. Ground water was encountered from 25 to 40 feet bgs in limestone and clay. MW-1 was drilled to approximately 40 feet deep and was reported to produce at greater than 60 gallons per minute (gpm) through an open bottom completion (Faber, 1996).

The depth to shallow ground water at this site ranges from an average depth of 6.57 feet from the top of the well casing (TOC) at MW-3 (located approximately 150 feet east of Prickly Pear Creek), to 30 feet below the TOC at MW-2 (on the west side of the existing Phase I and II drainfields). The depth to shallow ground water at MW-1 was 17 feet below the TOC on January 3, 2008.

D. Hydrology

Initially, the applicant submitted a hydraulic conductivity of 882 ft/day based on a four-hour aquifer pump test conducted on October 3, 1996 in the shallow ground water aquifer at monitoring well MW-1 (Faber, 1996). The hydraulic gradient submitted was 0.019 ft/ft. At that time, the direction of shallow ground water flow was estimated to be N57°W towards Prickly Pear Creek, which is approximately 500 to 658 feet northwest and hydraulically downgradient from the existing subsurface drainfield area.

On January 3, 2008, a 24-hour constant rate (85 gpm) shallow aquifer pump test was conducted. MW-1 was used as the pumping well. MW-2 was used as an observation well. The average transmissivity was 8,370 ft^2/day based on drawdown and recovery data from MW-1 and MW-2. The aquifer thickness at MW-1 was estimated at 25 feet. Therefore, an average hydraulic conductivity (K) was calculated at 335 ft/day. The revised hydraulic gradient is 0.005 ft/ft to the N55°W from Outfall 001. This is based on a three-point calculation using the three shallow onsite ground water monitoring wells (MW-1, MW-2, and MW-3). The Department has verified this gradient (using May 29, 2008 elevations) via generating a contoured flow map that includes the surface water elevations as provided by the applicant.

According to the DEQ Public Water Supply, Source Water Delineation and Assessment Report (2005), "Stoney Brook Village Condominium Association Public Water System," the shallow alluvial-colluvial aquifer is unconfined and in some reaches may be hydraulically connected to Prickly Pear Creek. The fractured limestone bedrock offers an upward (confined) ground water flow gradient.

The nearest downgradient surface water is an unlined pond used for potential fire-suppression. The pond is located approximately 413 feet from the hydraulically downgradient side of the existing (Phase I and II) drainfield area. It is northwest of the proposed 380-foot source specific ground water mixing zone (see Part VI of this statement of basis).

Prickly Pear Creek is 600 feet hydraulically downgradient (N55°W) from Outfall 001. Prickly Pear Creek is generally considered to be a hydraulic boundary in this area (DEQ, PWS 2005). According to the PWS

report, ground water flows towards Prickly Pear Creek then parallels the creek-flow to the north, until a gaining reach and/or sufficiently low seasonality occurs.

V. RECEIVING WATER

A. Surface Water

Prickly Pear Creek (PPC) is classified I according to ARM 17.30.610(1)(a)(ix), which means it does not fully support any one of its beneficial uses. The goal of the state is to have these waters fully support: drinking, culinary and food processing purposes after conventional treatment; bathing, swimming and recreation; growth and propagation of fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supplies [ARM 17.30.628(1)].

Pursuant to ARM 17.30.628(2), discharges to I class waters may not violate the specific water quality standards listed under ARM 17.30.628(2)(a through k). In addition, discharges are subject to ARM 17.30.635 through 637, 641, 645, 646, and the numeric water quality standards given in Department Circular DEQ-7, February 2006.

The stream segment of PPC, which includes the reach running through the SBCV property is identified as MT411006_050 (consists of PPC from Spring Creek to Lump Gulch) and was listed on Montana's 1996 Clean Water Act Section 303(d) List as impaired. The 2004 revised MDEQ 303(d) List also assessed this stream segment as an impaired water body requiring a Total Maximum Daily Load (TMDLs) for sediment (siltation and suspended solids) and metals, specifically for cadmium, lead, and zinc (USEPA, 2004 and 2006). Nutrients have not been identified as a cause of impairment in this segment of PPC however, in the lower reaches of PPC, impairment from high nutrient concentrations/loads have been established.

Since PPC is the closest (600 feet) surface water body hydraulically downgradient from Outfall 001 for which there is flow monitoring data available, trigger values (TVs) for the creek are provided. According to ARM 17.30.715(1)(c), discharges that contain toxic parameters or nutrients that may potentially discharge to surface water are considered to be significant if the discharge will cause a change that equals or exceeds the trigger values (TVs) as set forth in DEQ Circular 7 (2008).

Based on the level of effluent treatment maintained at the system, the discharge from the SBCV may potentially consist of elevated nutrient levels specifically, nitrate (as N) and total phosphorous (TP). The trigger value for nitrate (as N) must not equal or exceed 0.01 mg/L to be nonsignificant. The trigger value for TP must not equal or exceed 0.001 mg/L.

Nitrate (as N)

Nitrate (as N) concentrations in the effluent at the SBVCS were calculated by the Department using the dilution equation, which is

$$T.V. < \frac{(Q_D)(C_D) + (Q_L)(C_L)}{(Q_D + Q_L)}$$

Q_D = Effluent flow rate is 18,112 gpd or 12.58 gpm
C_D = Effluent total nitrogen, as N (TN) concentration is 24 mg/L (efficiency of RSF

wastewater treatment system).

Stream information was taken from a reach of Prickly Pear Creek near Clancy, upstream from SBVCS.

Q_L = 7-day, 10-year low flow surface water flow rate is 8.0 cfs (U.S. Department of the Interior, 2005).

C_L = Baseline/background nitrate (as N) concentration in the surface water is 0.15 mg/L in a sample collected (May 29, 2008) from Prickly Pear Creek adjacent to the southwest portion of the property and generally hydraulically upgradient from the facility.

Therefore, T.V. = 0.23 mg/L

The calculated nitrate (as N) increase is 0.08 mg/L (0.23 mg/L – 0.15 mg/L), which is greater than 0.01 mg/L, the T.V. for nitrate (as N) in the surface water.

According to DEQ Circular 7 (2008), the surface water quality standards for nutrients (total nitrogen and phosphorous) are narrative. ARM 17.30.715(1)(g) states that narrative standards which do not have a measurable effect on any existing or anticipated use or cause detrimental change in aquatic life or ecological integrity are considered nonsignificant.

However, the surface water body most proximal and also hydraulically downgradient to Outfall 001, for which there is no monitoring data available, is an unlined pond designated to be used for fire suppression at the SBCV. This pond is approximately 413 feet hydraulically downgradient from the drainfield/outfall area. It is 33 feet from the downgradient boundary of the source specific 380-foot ground water mixing zone. Based on SWLs in the three monitoring wells, surface water elevations measured along PPC adjacent to this development, and surface water elevations measured at the pond, all elevations indicate the potential for discharge particularly during locally seasonal low-flow, to the surface water through the ground water in the shallow unconfined aquifer.

To properly assess the initial impact(s) of nutrients discharged from the subsurface drainfields on the nearest surface water body and to demonstrate conformance with the narrative standard for nitrate (as N) and total phosphorous (TP) the fire-suppression pond shall be monitored for constituents associated with eutrophication. This is the process by which a body of water becomes either naturally or by pollution, rich in dissolved nutrients (as nitrates and phosphorous) and often with a seasonal deficiency in dissolved oxygen coinciding with increased algal growth (blooms).

The potential impacts of the effluent discharge on the pond via shallow ground water flow must be evaluated at a minimum for nutrient limits, nitrates (as N) and Total Phosphorous (TP). Impacts to the pond are considered important indicators of the shallow ground water quality potentially entering PPC because of: (1) the short distance (approximately 413 feet) from the discharge to the pond, (2) the previously unregulated discharge from Phases I and II, (3) the relatively rapid (8 to 16 ft/day) ground water velocity in the shallow ground water at this site, and (4) the proposed development of Phase III. The Department shall require quarterly sampling of the pond according to an approved Sampling and Analysis Plan that specifically addresses surface water sampling and the analytical methods used. Analyses shall include at a minimum, nitrate (as N), total ammonia, phosphorous, dissolved oxygen, temperature, and chlorophyll-a (see Table 12).

Phosphorous

An evaluation of the phosphorous adsorptive capacity of the soils indicates that phosphorous will be removed for a period of 52.8 years prior to discharge to any surface waters. This is greater than the 50-year breakthrough criteria required according to ARM 17.30.715(1)(e) [see Section VII.A.2.b.of this statement of basis]. Therefore, additional analysis of potential phosphorous impacts to the surface water is not required. However, monitoring for TP levels shall be required at the first hydraulically downgradient surface water, which is the unlined fire suppression pond.

B. Ground Water

Effluent is discharged from the wastewater treatment facility to the ground water. Applicable water quality standards for individual parameters of concern are established according to the receiving ground water classification based on specific conductivity in umhos/cm or microSiemens/cm. Samples collected from onsite wells measured the specific conductivity within a range of 556 to 598 umhos/cm. This data indicate the shallow ground water in this area is Class I ground water.

Class I ground water has a specific conductivity of less than or equal to 1,000 μmhos/cm at 25 degrees Centigrade, as defined by ARM 17.30.1006(1). Therefore, according to ARM 17.30.1006 (Classifications, Beneficial Uses and Specific Standards for Groundwaters), the receiving water for Outfall 001 will be considered Class I ground water. ARM 17.30.1006(1)(a) states, the quality of Class I ground water must be maintained so that these waters are suitable for public and private water supplies, culinary and food processing, irrigation, commercial and industrial purposes, drinking water for livestock and wildlife, with little or no treatment. Human health standards listed in DEQ Circular 7 (February 2006) apply to concentrations of dissolved substances in Class I ground water.

Montana's nondegradation policy (75-5-303, MCA) applies to any activity of man resulting in a new or increased source which may cause degradation [ARM 17.30.705(1)]. The applicant must demonstrate that existing uses of state waters and the level of water quality necessary to protect those uses will be maintained. Compliance for permitting purposes is accomplished through a significance determination by the Department. A determination of nonsignificant changes in water quality is based on the criteria set forth in ARM 17.30.715 regarding flow volume, carcinogenic parameters, toxic parameters, nitrate and phosphorous concentrations, harmful parameters, and parameters for which there are only narrative water quality standards.

The applicable ground water quality standards and nondegradation significance criteria are included in Table 5.

Table 5. Applicable Water Quality Standards and Nondegradation/Nonsignificance Criteria

Parameter	DEQ Circular 7 Human Health Ground Water Standards	Nondegradation/Nonsignificance Criteria in Ground Water for Level II Treatment
Nitrate (as N)	10 mg/L	7.5 mg/L
Total Phosphorus	no standard	50 year breakthrough [(1)], mg/L
E-Coli Bacteria	<1 organism per 100 ml	<1 organism per 100 ml

[1]The phosphorus significance criteria is listed in ARM 17.30.715(1)(e): "changes in concentration of total inorganic phosphorus in ground water if water quality protection practices approved by the Department have been fully implemented and if an evaluation of the phosphorus adsorptive capacity of the soils in the area of the activity indicates that phosphorus will be removed for a period of 50 years prior to a discharge to any surface waters."

C. Water-Use Classification and Applicable Water Quality Standards

The average ambient nitrate + nitrite (as N) concentration in the shallow ground water is 0.55 mg/L. This concentration is based on five separate samples collected from October 2006 through August 2008 from monitoring well MW-1, which is the lateral-upgradient shallow monitoring well. Nitrate + nitrite (as N) in the hydraulically downgradient receiving water near Prickly Pear Creek averages 0.11 mg/L based on three separate samples that were collected from December 2007 through May 2008, from monitoring well MW-3 located approximately 150 from PPC

These samples are representative of the current quality of the shallow ground water in this area. Surface water samples collected from this segment of Prickly Pear Creek, which are adjacent to SBVCS development are in the range of data analyzed by the USEPA presented in the TMDL study for the Lake Helena Watershed Planning Area (2004 and 2006).

Based on shallow ground water samples collected from onsite wells, a summary of the quality of the shallow ground water is provided in Table 6.

Table 6. Local Shallow Ground Water Characteristics					
Parameter, units	**Average Value**	**Minimum Value**	**Maximum Value**	**Number of Samples**	**Source of Data**
Specific Conductance, µmhos/cm	556	577	598	3	MW1, PWS1&2
pH, s.u.	8.0	8.0	8.0	1	MW1
Chloride, mg/L	14	14	14	1	MW1
Escherichia Coli, #organisms/100ml	"Absent"				MW1
Nitrate + Nitrite, as N, mg/L	0.55	0.41	0.63	5	MW1
Total Kjeldahl Nitrogen, as N, mg/L	1.8	1.8	1.8	1	MW1

Domestic water supply for the SBCV comes from two deep (100 and 114 feet well total depths) fractured limestone bedrock Public Water Supply wells.

VI. GROUND WATER MIXING ZONE

A mixing zone, as defined in 75-5-103(18), "means an area established in a permit or final decision on nondegradation issued by the Department where water quality standards may be exceeded, subject to conditions that are imposed by the Department and that are consistent with the rules adopted by the Board." Requirements for granting a mixing zone are based on 75-5-301(4), MCA, which states that mixing zones must: (a) be the smallest practicable size, (b) have a minimum practicable effect on water uses, and (c) have definable boundaries. The Department has adopted rules implementing the nondegradation policy established in 75-5-303, MCA to provide that changes in nitrate (as N) in the ground water are nonsignificant if the discharge will not cause degradation of surface water and the predicted concentration of nitrate (as N) at the boundary of the ground water mixing zone does not exceed limits as specified in 75-5-301(5)(d)(iii), MCA.

The permittee has proposed to discharge all wastewater from Outfall 001 and has requested a ground water mixing zone at Outfall 001. The permittee must meet the requirements for a mixing zone, as set forth in 75-5-301(4), MCA and comply with mixing zone rules pursuant to ARM Title 17, Chapter 30, Subchapter 5. The Department shall assess the information received from the applicant concerning the biological, chemical, and physical characteristics of the receiving water as specified in ARM 17.30.506 or as requested by the Department. The Department will determine the applicability of a mixing zone, as well as the size, configuration, and location [see ARM 17.30.505(1)].

Therefore, the Department has determined that a 380-foot source specific ground water mixing zone [ARM 17.30.518(5)] extending in a N55°W direction from Outfall 001 is applicable at this site. The shape and size of the mixing zone is determined using the drainfield dimensions and information on water table elevations and topography. To qualify for a source specific ground water mixing zone [ARM 17.30.518], the concentration(s) of the pollutants at the hydraulically downgradient boundary of the mixing zone must meet the nonsignificance criteria specified in ARM 17.30.715(1)(d)(iii) and/or "trigger values" according to DEQ-7 (2008) (see footnote #22).

Based on a mass balance calculation [ARM 17.30.517(1)(d)], the maximum concentration of pollutants has been estimated at the hydraulically downgradient boundary of the proposed source specific 380-foot mixing

zone using the following site specific data: the average ambient concentration of nitrate + nitrite, as N (0.55 mg/L), the ground water flow rate based on the hydraulic conductivity (335 ft/day), hydraulic gradient (0.005 ft/ft) and the cross sectional area of the aquifer mixing zone including tangent angles (12,725.81 ft^3/day), and the total average design flow (2,421.4 ft^3/day) for all three Phases of the development.

Mixing zones may be granted for individual parameters present in a discharge. A source specific 380-foot ground water mixing zone will be granted for an individual parameter of nitrate (as N) [ARM 17.30.518(2)] at the SBCV.

No mixing zone will be granted if it would threaten or impair existing beneficial uses [ARM 17.30.506(1)]. DEQ Circular 7 (February, 2008) human health-based ground water standards must not be exceeded beyond the boundaries of a mixing zone [ARM 17.30.1005(2) and ARM 17.30.508(1)(a)]. In addition, the zone of influence of any drinking water well will not be allowed to intercept a ground water mixing zone [ARM 17.30.508(2)], specifically domestic supply well PWS1 at SBCV.

VII. PROPOSED DISCHARGE LIMITS AND CONDITIONS

A. Scope and Authority

The Montana Water Quality Act (Act) states that it is unlawful to discharge sewage, industrial waste or other wastes into any state water without a current permit from the Department (75-5-605(2), MCA). The Act also sets forth duties of the Department that shall include the following: issue, suspend, revoke, modify, or deny permits 401(1), MCA; examine information in order to issue a permit or issue a permit with conditions 401(2), MCA; and specify limitations in the permit 401(3), MCA. The Act also establishes that rules shall be adopted governing the application, authorization and issuance of permits to discharge sewage, industrial wastes or other wastes to state waters, provided the limitation of said permits will not result in pollution of any state waters.

ARM 17.30.1031 states that all issued MGWPCS permits must contain conditions including, but not limited to, discharge limitations, which will assure compliance with the ground water standards given due consideration to the economics of waste treatment and prevention. ARM 17.30.1005(1) states, the standards in ARM 17.30.1006 establish the maximum allowable changes in ground water quality and are the basis for limiting discharges to ground water.

B. Nondegradation/NonSignificance Evaluation

Concentration-based limits for nitrate (as N) in the ground water at the boundary of any applicable mixing zone are established according to levels of wastewater treatment [ARM 17.30.702(11)] (see Part II.B. of this statement of basis). Therefore, changes in nitrate (as N) in the ground water are considered to be nonsignificant when the predicted concentration of nitrate (as N) at the boundary of the ground water mixing zone does not exceed 7.5 mg/L from raw sewage discharged from a system using Level II treatment, as defined in 75-5-301(5)(d)(iii), MCA and ARM 17.30.715(1)(d)(iii).

1. Nondegradation-Based Effluent Limits (NBELs)

a. Total Nitrogen (TN)

Data show recirculating sand filter (RSF) wastewater treatment systems produce a high quality effluent, and are considered to be a Level II treatment. According to ARM 17.30.702(11), Level II treatment means, the wastewater treatment system removes at least 60% of the total nitrogen (TN) as measured from the raw sewage load to the system, or the system discharges a TN effluent concentration of 24 mg/L or less. The Department has established that a properly installed, operated and maintained RSF wastewater treatment system meets the definition of a Level II system.

The permit limit for TN will be set at 26 mg/L in the effluent, prior to discharge to the drainfield because an additional 7% of nitrogen removal (through treatment) is assumed to occur within the drainfield providing a final TN concentration discharged to ground water of 24 mg/L. Based on the performance of the system, the nondegradation-based effluent limits (NBELs) for TN are set forth in Table 7.

These limits are applicable to each effluent sample collected separately from each (2) dose tank (i.e., dose tank 001A/Phases I and II, and dose tank 001B/Phase III) prior to discharge to Outfall 001 (i.e.,subsurface drainfield).

b. Total Phosphorous (TP)

The wastewater treatment system has no tertiary phosphorous treatment process. An evaluation of the phosphorous adsorptive capacity of the soils in the area of the activity indicates that phosphorous will be removed for a period of 52.8 years prior to a discharge to any surface waters. This is greater than the 50-year breakthrough criteria required according to ARM 17.30.715(1)(e) [see Section VIII.B. of this statement of basis]. Therefore, additional analysis of potential phosphorous impacts to the surface water is not required.

Based on the performance of the system, the NBELs for TN and the load-based limits for TP are set forth in Table 7. These effluent limits are applicable to effluent samples collected at each (2) dose tank, separately (dose tank 001A/Phases I and II, and dose tank 001B/Phase III), prior to discharging to Outfall 001 (i.e., subsurface drainfields).

Table 7. Nondegradation-Based Effluent Limits for Outfall 001 (2 dose tanks to be sampled, analyzed, and evaluated separately).

Sample Locations	Parameter	Daily Maximum Concentration (1) mg/L	90-Day Average Load(1) (pounds per day)
Dose Tank 001A*	Total Nitrogen, as N (TN)(2)	26	2.63(3)
	Total Phosphorus, as P (TP)	NA	0.78
Dose Tank 001B**	Total Nitrogen, as N (TN)(2)	26	1.30
	Total Phosphorous, as P (TP)	NA	0.35

(1) See definitions in Part V of this permit.
(2) Total Nitrogen (TN) is the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen (as N).
(3) When the WQBEL concentration is greater than 26 mg/L TN, 26 mg/L is used in the calculation of the load limit.
NA Not Applicable
* Phases I & II
** Phase III

2. Water Quality-Based Effluent Limits (WQBELs)

The Montana Water Quality Act states, it is unlawful to discharge sewage, industrial wastes, or other wastes into any state waters (75-5-605(1)(c), MCA). The Act requires that a discharge to state waters shall not cause a violation of water quality standards (75-5-605(1)(a), MCA). Water quality limitations must be established in permits (75-5-605(1)(b), MCA) to control all pollutants or pollutant parameters that are or may be discharged at a level which will cause, have reasonable potential to cause or contribute to an excursion above any state water quality standard. The permittee must comply with Montana Numeric Water Quality Standards set forth in MDEQ Circular 7 (February 2006) and the protection of beneficial uses (ARM 17.30.1006).

Permits are required to include water-quality based effluent limits (WQBEL) when concentration established NBELs are not adequate to protect state water quality standards (40 CFR 122.44 and ARM 17.30.1344). Montana water quality standards (ARM 17.30.10 et seq.) define both ground water use classifications for all state waters and numeric and narrative standards that protect those designated uses. New sources, as defined in ARM 17.30.702(18), are subject to Montana Nondegradation Policy (75-5-303, MCA) and regulations (ARM 17.30.701 *et. seq*).

a. Total Nitrogen

The proposed wastewater system constitutes a new source [ARM 17.30.702(18)]. The Class I ground water is considered high quality water and is subject to Montana's Nondegradation Policy (75-5-303, MCA). The applicable ground water standard is based on nondegradation, with a nitrate (as N) concentration limit of 7.5 mg/L [ARM 17.30.715(1)(d)(iii)] at the end of the proposed source specific 380-foot ground water mixing zone.

The total nitrogen (TN) concentration is the sum of nitrate plus nitrite, as nitrogen (N) plus Total Kjeldahl Nitrogen (as N) [TKN]. TKN is the sum of ammonia and organic nitrogen components. Raw wastewater consists primarily of ammonia. Treatment in septic tanks and drainfield convert the ammonia to nitrite and nitrate, as N. Sand filters, trickling filters, and aerobic treatment units, as well as unsaturated zone material beneath the drainfields, convert the organic N (TKN) to nitrate, as N. The Department assumes all of the nitrogen discharged to the drainfield in the effluent has been converted to nitrate, as (N) [MDEQ, 2005].

The allowable discharge concentration is derived from the mass balance water quality equation [ARM 17.30.517(1)(d)], which considers dilution and the background concentration of the receiving water (EPA, 2000), pursuant to a source specific 380-foot ground water mixing zone [ARM 17.30.518(5)].

The total allowable discharge concentration beneath the drainfield area for Phases I, II, and III (Outfall 001) is:

$$C_2 = \frac{C_3(Q_1 + Q_2) - C_1 Q_1}{Q_2}$$

C_2 = 44 mg/L

C_1 = ambient ground water (background) concentration, is 0.55 mg/L
C_2 = allowable discharge concentration (TN) beneath the drainfield, in mg/L
C_3 = ground water concentration limit for pollutant (from DEQ Circular 7 or other appropriate water quality standard) at the end of the mixing zone is 7.5 mg/L, instantaneous (no single sample shall exceed)
Q_1 = ground water volume is 12,725.81 ft^3 / day
Q_2 = maximum flow of discharge (total average design flow of system is 2,421.40 ft^3 /day)

The volume of ground water that will mix with the discharge (Q_1) is estimated using Darcy's equation: Q_1 = K I A. The calculated value of Q_1 is 12,725.81 ft^3/day for the proposed mixing zone; assuming an aquifer hydraulic conductivity (K) value of 335 ft/day from a 24-hour constant rate pump test, a hydraulic gradient (I) based on the applicant's three point solution and the Department's flow map of 0.005 ft/ft, and a cross sectional area of flow (A) at the downgradient boundary of the source specific 380-foot mixing zone of 7,597.50 ft^2 (includes tangents).

The average daily flow of the wastewater disposal system is 18,112 gpd, or 2,421.40 ft^3/day. The nitrate (as N) concentration must not exceed 7.5 mg/L at the end of the ground water mixing zone. The average ambient concentration of nitrate-nitrogen in the ground water is 0.55 mg/l (C_1) from the shallow ground water samples collected from MW-1. It is assumed that the entire TN load in the effluent converts to nitrate (as N) and enters the ground water.

As discussed in Part VII, nitrate reduction of approximately 7 percent is assumed to occur beneath the drainfield. Therefore, to discharge a TN concentration of 44 mg/L below the drainfield, the effluent limit from the RSF system at each of the two dose tanks (separately), prior to discharge to the subsurface drainfields is calculated at 47 mg/L of TN.

44 mg/L (.07) = 3.08 mg/L	Assumed nitrate reduction beneath the drainfield.
44 mg/L + 3 mg/L = 47 mg/L	Total maximum concentration of TN prior to discharge to the subsurface drainfields (Outfall 001).

The calculated effluent concentration of TN must not exceed 47 mg/L at the total average design flow in order to maintain a concentration that is less than the state water quality standard of 7.5 mg/L for nitrate plus nitrite (as N) in the ground water at the mixing zone (Part VI) boundary. The WQBEL will be expressed as a load (lbs/day) based on the total average design flow of the system (18,112 gpd) and the calculated maximum concentration as follows:

Load limit (lbs/day) per outfall = effluent flow rate (gpd) x daily maximum concentration (mg/L) ***x*** *(8.34 x 10^{-6})*

Load limit (lbs/day) per outfall= (18,112 gpd) **x** (47 mg/L) **x** (8.34 x 10^{-6})

Load limit (lbs/day) per outfall= 7.1 lbs/day

The TN WQBELs for Outfall 001 are summarized in Table 8.

b. Total Phosphorus

A concentration of 10.6 mg/L of total phosphorous (TP) is consistent with the concentration found in residential wastewater. The total estimated load for TP at Outfall 001 is 1.13 lbs/day using an average daily flow rate for the 64 total units (existing and proposed).

More precisely, phosphorus is removed mainly through soil sorption processes, which are slow and vary based on soil composition. In accordance with ARM 17.30.715(1)(e), TP limitations are imposed to ensure that the quality of the effluent meets the nondegradation significance criteria prior to potentially discharging into any surface water. The effluent limits do not include a concentration limit for phosphorus because the method used to determine compliance is the 50-year breakthrough analysis. The 50-year breakthrough nondegradation criterion is based on the amount of soil available to adsorb the phosphorus between the discharge point and the surface water using the average load of phosphorus from the wastewater source.

A phosphorous breakthrough analysis was calculated based on the shallow ground water flow direction of N55°W at the site and a distance of 413 feet to the nearest hydraulically downgradient surface water, which is SBCV's fire suppression pond. The analysis shows the breakthrough time to the surface water for Outfall 001 is 52.8 years. Therefore, the discharge is considered nonsignificant degradation pursuant to the criteria of ARM 17.30.715(1)(e).

The TP WQBEL for Outfall 001 is summarized in Table 8.

c. *E-Coli* Bacteria

The Department is not granting a mixing zone for *E-Coli* bacteria because a properly sited and operated drainfield should remove most, if not all, of the pathogenic bacterial indicators within 2 to 3 feet of the drainfield's infiltrative surface (USEPA, 2002). The *E-Coli* water quality standard is <1 organism per 100 ml in the ground water (DEQ Circular 7, 2/2008). Based on the following site-specific criteria, ground water monitoring for *E-Coli* bacteria at the hydraulically downgradient edge of the subsurface drainfields will be required at this time.

- The depth to shallow ground water beneath the existing and proposed drainfield areas ranges from 17 feet below the TOC at MW-1 (north side of Phases I and II), to 30 feet below the TOC in MW-2 (west and downgradient from Phase I and II drainfields).
- Subsoil materials offer little natural treatment in this area based on descriptions provided on boring logs in the area which indicate angular and blocky limestone-gravel with clay and cobbles from 4 to 12 feet deep with fractured limestone bedrock subcropping beneath the colluvial sediments from 12 to 25 feet deep.
- Hydraulic connection to Prickly Pear Creek and the pond is anticipated during at least some months of the year (low surface water level).

- Approximately 10 years of operation at Phases I and II without monitoring (i.e., no MGWPCS discharge permit).

The systematic pressure-dosing of the drainfields will minimize saturated conditions and maximize the die-off rate in the natural sediments. The proposed subsurface drainfields will discharge effluent at approximately 2 to 4 feet below the ground surface. The coarse, cobbly to angular chips of limestone with clay found in the subsoils and the subcropping of fractured limestone bedrock may not provide appropriate or adequate soil-subsoil materials in the unsaturated zone where treatment may occur naturally.

In the event of an *E-Coli* bacteria concentration detected above the water quality standard (less than 1 organism per 100 ml) in the ground water monitoring well at the end of the drainfields and/or at the end of the ground water mixing zone, the exceedance(s) shall be verified by a timely (72-hour) re-sampling. A validated *E-Coli* exceedance confirming the presence of *E-Coli* bacteria in the ground water will require an approved (by the Department) disinfection system to be added to the wastewater treatment system.

d. BOD_5 and TSS

BOD_5 and TSS are monitored for wastewater treatment system efficiency to ensure the effective removal of biological material and that the proper aerobic biological processes are being maintained. There are no numeric ground water quality standards for BOD and TSS, however according to ARM 17.30.1006(1)(b)(ii) the beneficial uses for a Class I ground water must be maintained. BOD and TSS are not subject to nondegradation unless they have a reasonable potential to affect a beneficial use based on the significance criteria for BOD and TSS, which are narrative [ARM 17.30.715(1)(g) and DEQ Circular 7].

Table 8. Water Quality-Based Effluent Limits for Outfall 001

Parameter	Daily Maximum[(1)] Concentration (mg/L)	90-Day Average Load[(1)] (pounds per day)
Total Nitrogen, as N [TN]	47	7.1
Total Phosphorus, as P [TP]	NA	1.13

(1) See definitions, Part V of the permit
NA Not Applicable

IX. PROPOSED FINAL EFFLUENT LIMITS

The proposed effluent limitations for Outfall 001 are summarized in Table 9 and are based on the more restrictive of the nondegradation and water quality-based criteria discussed in previous sections. The final proposed effluent concentration limit for TN is nondegradation-based, relating to the expected performance of the RSF system and the subsurface drainfields with proper operation and maintenance. The concentration limit is proposed to ensure the system operates at the Level II requirement with an effluent concentration of TN at Outfall 001, not to exceed 24 mg/L, as specified in ARM 17.30.702(11).

Although not as stringent as the NBELs, the mass-balance calculation establishes the maximum concentration of TN in the effluent that can be discharged beneath the drainfield at the outfall. The nitrate sensitivity calculation provides the concentration-based limit that ensures the concentration of nitrate (as N) in the ground water at the end of the ground water mixing zone will not exceed 7.5 mg/L [75-5-301(5)(d), MCA and ARM 17.30.715(1)(d)(iii)] pursuant to a 380-foot source specific ground water mixing zone [ARM 17.30.518(5)].

The proposed final effluent load limit is based on the average design flow and the NBEL concentration based on the laboratory analysis from the required composite quarterly sample collected from each of the two dose tanks, separately. This is because the WQBEL calculated for the outfall is greater than 26 mg/L. The load limit for TN is based on complying with the nondegradation criteria of 7.5 mg/L for nitrate (as N) in ground water at the end of the proposed mixing zone.

The effluent limit for TP is determined according to the nondegradation significance criteria [ARM 17.30.715(1)(e)]. The nondegradation-based effluent load limit considers the assimilative capacity of the soil system to estimate the maximum load of phosphorus discharged to the ground water without exceeding the 50-year breakthrough. The 90-day average load limit will provide protection for the surface and ground water quality. However, surface water grab samples required to be collected quarterly from the fire suppression pond (nearest hydraulically downgradient surface water) shall ensure nutrient levels are not exceeded in PPC from this outfall/discharge (see Part V.A. of this statement of basis).

The effluent limits apply to the treated effluent at the dose tank (see Table 9) prior to discharge to the drainfield as shown in Attachment 1 and 2.

Table 9. Numeric Effluent Limits for Outfall 001 (2 dose tanks to be sampled, analyzed, and evaluated separately).

Sample Locations	Parameter	Daily Maximum Concentration (1) mg/L	90-Day Average Load(1) (pounds per day)
Dose Tank 001A*	Total Nitrogen, as N (TN)(2)	26	2.63(3)
	Total Phosphorus, as P (TP)	NA	0.78
Dose Tank 001B**	Total Nitrogen, as N (TN)(2)	26	1.30
	Total Phosphorous, as P (TP)	NA	0.35

(1) See definitions in Part V of this permit.
(2) Total Nitrogen (TN) is the sum of nitrate + nitrite (as N) and total Kjeldahl nitrogen (as N).
(3) When the WQBEL concentration is greater than 26 mg/L TN, 26 mg/L is used in the calculation of the load limit.
NA Not Applicable
* Phase I and II
** Phase III

Other Discharge Limitations:

The total average design effluent flow discharged to Outfall 001 shall not exceed 18,112 gpd. Existing Phase I and II shall not exceed 12,112 gpd. Proposed Phase III shall not exceed 6,000 gpd.

X. MONITORING REQUIREMENTS

A. Influent Monitoring

No influent monitoring will be required.

B. Effluent Monitoring

Effluent monitoring is essential to ensure the effective treatment and consistency of the wastewater discharged from the facility. The effluent limits are established to protect the ground water from a change

in water quality that would cause degradation [ARM 17.30.715] or cause a change in beneficial use [ARM 17.30.1005(1)]. Samples or measurements shall be representative of the volume and nature of the monitored discharge at the outfall.

The Department shall require effluent sampling using specified monitoring methods at designated locations and intervals (75-5-602(4), MCA). Effluent monitoring/sampling shall be conducted by collecting a separate composite sample from each of the wastewater treatment systems' dose tank that is representative of the discharge prior to discharging to the subsurface drainfields (Outfall 001 and Outfall 002). Individual composite samples collected from each of the two dose tanks separately, shall be submitted to the laboratory for analyses of all of the parameters in Table 10.

The permittee shall monitor the effluent to be discharged at Outfall 001(two separate dose tank samples) for the parameters in Table 10. These samples shall be collected at the frequency and with the type of measurement and sampling as indicated in Table 10 [ARM 17.30.1031(5)]. It is the responsibility of the permittee to establish and maintain records of all monitoring (75-5-602(1), MCA), and make reports (DMRs) of the required data to the Department (75-5-602(2), MCA). If no discharge occurs during the entire monitoring period, it shall be stated in a Discharge Monitoring Report (DMR) that "no discharge" occurred.

TABLE 10. Parameters To Be Monitored in the Effluent Prior To Discharging To Outfall 001 (At Each of the Two Dose Tanks, Separately)

Sample Locations	Parameter, units	Frequency	Sample Type[(1)]
Dose Tank 001A*	Effluent Flow Rate, gpd[(2)]	Continuous	Continuous
	Total Suspended Solids (TSS), mg/L	Quarterly	Composite
	Biological Oxygen Demand (BOD_5), mg/L	Quarterly	Composite
	Total Kjeldahl Nitrogen, as N (TKN), mg/L	Quarterly	Composite
	Nitrate + Nitrite (as N), mg/L	Quarterly	Composite
	Total Phosphorous, as P (TP), mg/L	Quarterly	Composite
	Total Nitrogen, as N (TN), mg/L[(3)]	Quarterly	Calculated[(3)]
	Total Nitrogen, as N (TN), lb/da	Quarterly	Calculated[(4)]
	Total Phosphorous, as P (TP), lb/da	Quarterly	Calculated[(4)]
Dose Tank 001B**	Effluent Flow Rate, gpd[(2)]	Continuous	Continuous
	Total Suspended Solids (TSS), mg/L	Quarterly	Composite
	Biological Oxygen Demand (BOD_5), mg/L	Quarterly	Composite
	Total Kjeldahl Nitrogen, as N (TKN), mg/L	Quarterly	Composite
	Nitrate + Nitrite (as N), mg/L	Quarterly	Composite
	Total Phosphorous, as P (TP), mg/L	Quarterly	Composite
	Total Nitrogen, as N (TN), mg/L[(3)]	Quarterly	Calculated[(3)]
	Total Nitrogen, as N (TN), lb/da	Quarterly	Calculated[(4)]
	Total Phosphorous, as P (TP), lb/da	Quarterly	Calculated[(4)]

(1) See definitions, Part V of the permit.
(2) To be measured using totalizing flow meters.
(3) Total Nitrogen, as N = nitrate + nitrite, as N + total Kjeldahl nitrogen, as N.
(4) See definition of "90-day average" in Part V of the permit.
*Phases I and II
**Phase III

The 90-day average load for TN and TP are the sum of the calculated loads for each TN and TP sample collected within the 90-day period, divided by the number of samples collected and analyzed for TN and TP.

The permittee shall install, use, and maintain monitoring equipment or methods (75-5-602(3), MCA). The effluent measurement method shall be by totalizing flow meter(s). Dose counts or pump run-times will not be accepted for new wastewater systems. For existing Phases I and II, the permittee shall monitor the flow of the effluent to Outfall 001 at two meters one located following pump tank "A" and another meter following pump tank "B" prior to entering a common pressure-dose tank (effluent sample designation 001A) before discharging to the subsurface drainfields (see Attachment 1). For proposed Phase III, the permittee shall monitor the flow of the effluent to Outfall 001 at a meter located following the pump tank ("C") prior to entering the pressure-dose tank (001B) before discharging to the subsurface drainfield. The permittee has stated in the permit application that the method of flow monitoring will be three (3) AMCO 3-inch Class II turbine T3000 totalizing flow meters. The permittee shall report the flows for Outfall 001 based on the average gallons per day (gpd) for each quarter at each of the two dose tanks (001A and 001B) separately, followed by a summation of the two average flows in gpd.

C. Ground Water Monitoring

ARM 17.30.706(6) specifies that in order to ensure that a proposed activity will not result in degradation, the Department may require monitoring to verify compliance with this subchapter and 75-5-303, MCA.

In addition, ARM 17.30.505(1)(e) states, "estimated parameter levels in the mixing zone area will be calculated, unless the Department determines that monitoring is necessary due to the potential harm to the impacted water and its beneficial uses." To ensure compliance with applicable water quality standards and beneficial uses at the hydraulically downgradient boundary of the ground water mixing zone, monitoring may be required. Ground water monitoring is particularly applicable if there is an overriding site-specific impact related reason to require monitoring and the mixing zone is within 500 feet of surface water, another ground water mixing zone, or a drinking water well or if there is some other overriding site-specific, impact related reason to require monitoring [ARM 17.30.517(1)(d)(ix)].

Ground water monitoring will be required in this permit due to the following site-specific criteria:

- The proximity of hydraulically downgradient potential receivers, such as the fire suppression pond, which is located adjacent to the northwest boundary of the proposed source specific ground water mixing zone. The public water supply well (PWS1) is located approximately 100 ft west of the proposed mixing zone. Prickly Pear Creek is located approximately 187 feet from the proposed mixing zone boundary.
- The depth to shallow ground water beneath the existing and proposed drainfield areas ranges from 17 feet below the TOC at MW-1 (north side of Phases I and II drainfield area), to 30 feet below the TOC in MW-2 (west side of Phase I and II drainfield area). In the PPC floodplain hydraulically downgradient from Outfall 001, the average SWL in MW-3 is 6.57 feet below the TOC.
- Hydraulic connection of the shallow ground water to nearby surface water at the fire-suppression pond and Prickly Pear Creek is anticipated during at least some months of the year (seasonally low surface water level).
- Potential pollutant migration pathways (vertically downward and horizontally) may be highly variable due to the following: soils and subsoils that consist of colluvium, which are composed of angular and blocky limestone-gravel with clay and cobbles generally providing rapid travel times in

the subsurface, and subcrops and shallow weathered and fractured limestone bedrock directly beneath the thin veneer of colluvial soils and subsoils. None of the above offer much opportunity for sufficient natural treatment in the subsurface in this area.

- The two aquifer pump tests conducted at this site indicate relatively high hydraulic conductivities (335 ft/day and 882 ft/day) in the shallow aquifer, coupled with a mapped and calculated hydraulic gradient of 0.005 ft/ft, and using estimated effective porosities of 10% to 20% demonstrates a calculated velocity of the ground water in the shallow aquifer from 16.75 ft/day to 8.38 ft/day, respectively.
- Phases I and II have already been in operation for approximately 10 years without conducting any monitoring (i.e., no MGWPCS discharge permit).

The permittee is required to monitor the ground water quality at the hydraulically downgradient boundary of the proposed source specific 380-foot ground water mixing zone. Ground water monitoring well MW-3 was installed on December 20, 2007, approximately 90 feet northwest (N55°W) of the hydraulically downgradient boundary of the proposed mixing zone. MW-3 was drilled to a total depth of 23 feet bgs into gray limestone. The well is an open bottom completion with a 20-foot screened interval from 3 to 23 feet. The screened interval encompasses alluvial sand and gravel, silt and sand, and decomposed limestone. The SWL was reported on the well completion diagram at 7 feet below the TOC. This well (MW-3) shall serve as a monitoring point for the source specific 380-foot ground water mixing zone.

Beginning no later than the date of permit issuance, a concrete apron must be maintained around the well casing (MW-3) at the ground surface to protect the ground water from surface infiltration around the well casing. This apron must be sloped away from the well casing so that run-off can occur at a 3+ foot distance from the well. No cracks shall be allowed to exist indefinitely but must be patched within 30 days from discovery. A quarterly maintenance schedule shall be setup to check the integrity of this concrete apron. Records of these inspections and potential repairs shall be maintained onsite.

Since UV treatment will not be installed and there is no mixing zone for *E-Coli* bacteria, an additional shallow ground water monitoring well (MW-2) was constructed hydraulically downgradient at the southern corner of the Phase I and II drainfield area. MW-2 was drilled on December 19, 2007, to a total depth of 53 feet bgs. The well was completed with an open bottom, as well as a screened interval that extends from 22 to 53 feet bgs. This well (MW-2) shall serve as a monitoring point for *E-Coli* bacteria.

These monitoring well locations (MW-2 and 3) were approved by the Department prior to well installation. Combined open bottom and screening is not an approved method of monitoring well completion, but will suffice for this permit cycle. In addition, a concrete apron around MW-3 shall be constructed appropriately and its integrity maintained, as described above.

MW-2 and MW-3 must be constructed and secured according to ARM 17.50.707. A copy of the completed driller's logs was submitted to the Department with the modified application that was received on June 10, 2008.

The parameters to be monitored and the sampling frequency for monitoring well MW-3 are given in Table 11.

Table 11. Ground Water Monitoring Parameters for Monitoring Well MW-3

Parameter, units	Frequency	Sample Type[(1)]
Static Water Level (SWL), feet below top of casing	Quarterly	Instantaneous
Nitrate (as N), mg/L	Quarterly	Grab
Total Kjeldahl Nitrogen (TKN), mg/L	Quarterly	Grab
E-Coli bacteria, organisms/100mL	Quarterly	Grab
Chloride, mg/L	Quarterly	Grab
Specific Conductivity, umhos/cm	Quarterly	Grab
Total Phosphorous, as P (TP), mg/L	Quarterly	Grab
Total Nitrogen, as N (TN) mg/L	Quarterly	Calculated

(1) See definitions, Part V. of the permit.

The monitoring of chloride and specific conductivity is used as indicators of potential impacts from the wastewater to the ground water. Specific conductivity must be monitored to more accurately determine beneficial use (ARM 17.30.1006) in this first permit cycle.

The shallow ground water sampling/monitoring point (MW-2) for *E-Coli* bacteria is located at the hydraulically downgradient edge of the drainfields. Therefore, *E-Coli* bacteria monitored in the ground water in MW-2 must be less than the ground water quality standard (less than 1 organism/100 mL, see Table 1). The parameters to be monitored and the sample frequency for monitoring well MW-2 are given in Table 12.

Table 12. Ground Water Monitoring Parameters for Monitoring Well MW-2

Parameter, units	Frequency	Sample Type[(1)]
Static Water Level (SWL), feet below top of casing	Quarterly	Instantaneous
E-Coli Bacteria, organisms/100 ml	Quarterly	Grab
Nitrate (as N), mg/L	Quarterly	Grab

(1) See definitions, Part V. of the permit.

Surface water monitoring at the fire suppression pond shall include analyses of the parameters listed in Table 13, to be sampled at the frequency and according to the type of sample indicated.

Table 13. Surface Water Monitoring Parameters at the Fire Suppression Pond

Parameter, units	Frequency	Sample Type[(1)]
Surface Water Elevation (at the pond), feet	Quarterly	Instantaneous
Surface Water Elevation (adjacent location along PPC)	Quarterly	Instantaneous
Nitrate (as N), mg/L	Quarterly	Grab
Phosphorous (as TP), mg/L	Quarterly	Grab
Dissolved Oxygen (DO), mg/L	Quarterly	Instantaneous
Total Ammonia, mg/L	Quarterly	Grab
Temperature, degrees Fahrenheit	Quarterly	Instantaneous
Chlorophyll-a, mg/m^3	Quarterly	Grab

(1) See definitions, Part V. of the permit.

Ground water and surface water sample collection, preservation and analysis shall be conducted according to ARM 17.30.1007 and "Non-Point Source Water Quality Standard Operating Procedures" (4/1/95) at

http://deq.mt.gov/wqinfo/monitoring/SOP/pdf/10-0.pdf, until the permit is issued. No later than 60 days from the date of permit issuance, the permittee shall develop and maintain onsite a site specific Standard Operating Procedure (SOP) manual and a Sampling and Analysis Plan (SAP) for monitoring and sampling the ground water monitoring well(s) and the surface water (i.e., the pond).

D. Corrective Action – Ground Water Trigger Values

The trigger values for ground monitoring well MW-3 are listed in Table 14. An exceedance of a trigger value for either *E-Coli* bacteria or nitrate (as N) will require a resample be collected from the monitoring well within 72 hours of the laboratory notification of the analytical results from the scheduled sampling event. Corrective action will need to be implemented should the analytical results from the re-sample verify the exceedance(s).

Table 14. Ground Water Trigger Values for Monitoring Well MW-3

Parameter, units	Trigger Value
Nitrate (as N), mg/L	7.5
E-Coli Bacteria, organisms/100mL	Equal to or greater than 1

The trigger value for ground water monitoring well MW-2 is listed in Table 15. An exceedance of the trigger value for *E-Coli* bacteria will require a resample be collected from the monitoring well within 72 hours of the laboratory notification of the analytical results from the scheduled sampling event. Corrective action will need to be implemented should the analytical result from the resample verify the exceedance.

Table 15. Ground Water Trigger Values for Monitoring Well MW-2

Parameter, units	Trigger Value
E-Coli Bacteria, organisms/100 ml	Equal to or greater than 1

Ground water corrective action could involve but not be limited to, one or more of the following measures based on the nature and extent of the potential impacts to the ground water quality.

- Identification of the probable cause and extent of the ground water quality changes.
- Installation of additional ground water monitoring wells, including an upgradient well.
- Increased sampling (frequency and/or constituents).
- Increase the efficiency of the wastewater treatment system.
- Reduce the amount of nutrients or other parameters discharged into the ground water.
- Addition of disinfection to the effluent prior to discharge, if E-*Coli* bacteria compliance limit was exceeded.
- Supply drinking water to hydraulically downgradient residences, potentially as far as those hydraulically downgradient and downstream along PPC.

E. Surface Water Quality Limits

Surface water parameters shall not exceed water quality standards set forth in DEQ Circular 7 (2008).

XI. NONDEGRADATION SIGNIFICANCE DETERMINATION

The Department has determined that this discharge constitutes a new or increased source and there will be no degradation of state waters for the purpose of the Montana Nondegradation Policy [75-5-303, MCA; ARM 17.30.702(18)]. The applicable water quality standards for Class I ground water are summarized in Table 5. The effluent limits for TN and TP are based on compliance with water quality standards. The proposed discharge will not exceed the water quality standard for nitrate (as N) of 7.5 mg/L at the hydraulically downgradient boundary of the source specific 380-foot ground water mixing zone for Outfall 001.

XII. INFORMATION SOURCES

In the development of the effluent limitations, monitoring requirements and special conditions for the draft permit, the following information sources were used to establish the basis of the draft permit and are hereby referenced:

ARM Title 17, Chapter 30, Sub-chapter 5 - Mixing Zones in Surface and Ground Water, September 1999.

ARM Title 17, Chapter 30, Sub-chapter 7 - Nondegradation of Water Quality, March 2000.

ARM Title 17, Chapter 30, Sub-chapter 10 - Montana Ground Water Pollution Control System (MGWPCS), March 2002.

C & H Engineering and Surveying, Inc., Test Hole Logs (#1 through#5), August 25, 1995.

Cherry, J.A. and Freeze, R. A., *Groundwater*, Prentice-Hall Inc., Englewood Cliffs, NJ., 1979. Chapter 2, pages 26-29.

DEQ Circular 4, 2004.

DEQ Circular 7 – Montana Numeric Water Quality Standards, February 2008.

DEQ, Memo-Regensberger, "Revised Modification of Phosphorous Concentration for Domestic Sewage in Nondegradation Reviews," October 29, 1998.

DEQ, "Nitrate Sensitivity Analysis Input Data", 1994.

DEQ, "Non-Point Source Water Quality Standard Operating Procedures" (4/1/95) at www.deq.state.mt.us/wqinfo/monitoring/SOP/Sap.asp

DEQ Public Water Supply, Source Water Delineation and Assessment Report, "Stoney Brook Village Condominium Association Public Water System," February 18, 2005.

DEQ, Water Quality Information, Quality Assurance, "Historical Nonpoint Source Water Quality Standard Operating Procedures (SOPs), Section 12, March 31, 1999.

DEQ, Water Quality Information, Surface Water Monitoring, Quality Assurance Program, "New: Sample Collection and Laboratory Analysis of Chlorophyll-a (SOP)", WQPBWQM-011, Rev# 4, Section 3.4, June 5, 2008

Faber, Pat, "Stony Brook Hydrogeologic Study", conducted on October 3, 1996.

GWIC Database, http://mbmggwic.mtech.edu

McCarthy, P.M., "Statistical Summaries of Streamflow in Montana and Adjacent Areas, Water Years 1900 through 2002", U.S. Department of the Interior and U.S. Geological Survey, Scientific Investigations Report 2004-5266, 2005.

USDA, DNRC, "Jefferson County Area and Part of Silver Bow County, Montana", April 11, 2007.

U.S. Environmental Protection Agency for Montana Department of Environmental Quality, *Framework Water Quality Restoration Plan and Total Maximum Daily Loads (TMDLs) for the Lake Helena Watershed Planning Area:*

a. Volume I – Appendices, December 2004
b. Volume II – Final Report, August 2006

U.S. Environmental Protection Agency, Rev September 2000. U.S. EPA NPDES Permit Writers' Course, Helena, Montana, September, 2000, Workbook EPA 833-B-97-001.

U.S. Environmental Protection Agency, February 2002. *Design Manual: Onsite Wastewater Treatment and Disposal System*. EPA 625/R-00/008, p. 3-29 (Table 3-19) and Fact Sheet TFS-9 "Fixed Film Processes", and Table 1, TFS-51.

XIII. ATTACHMENTS

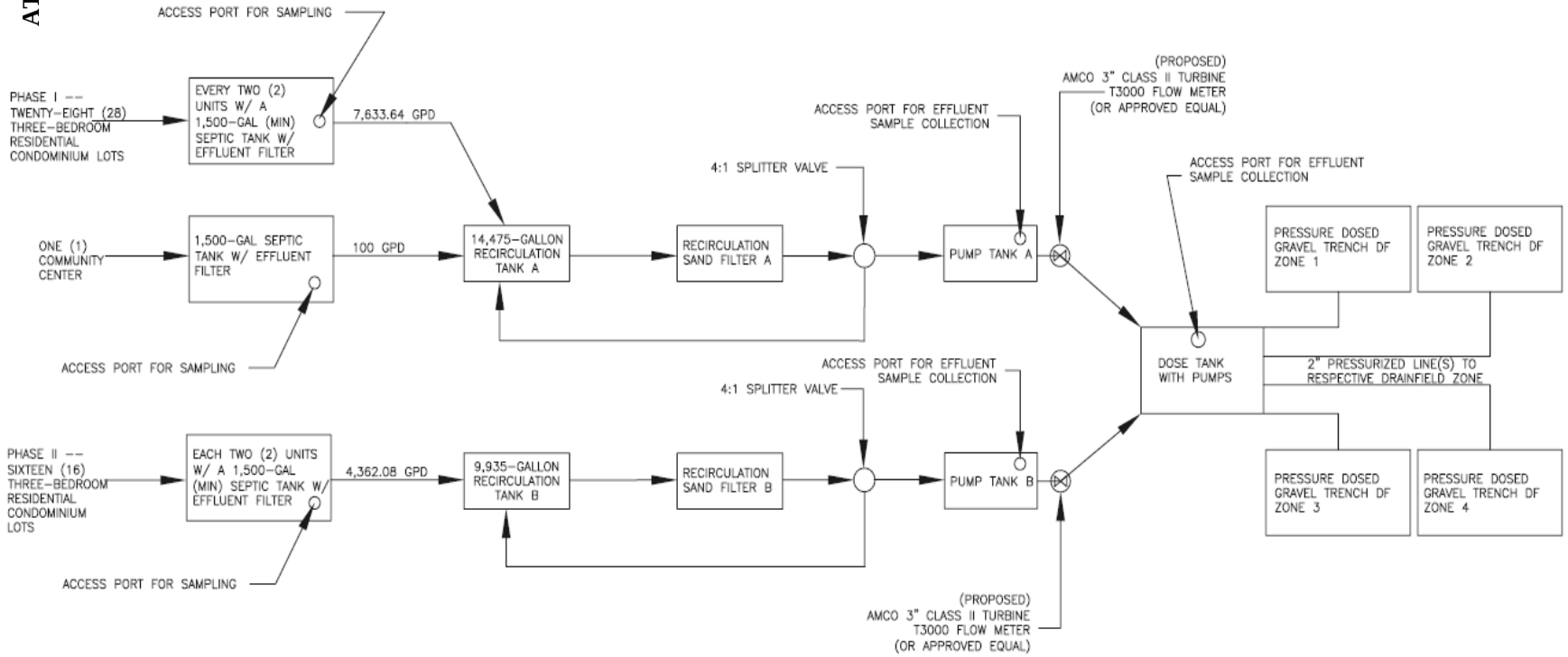
Attachment 1 - Wastewater Flow Line-Diagram for Existing Phases I and II
Attachment 2 – Wastewater Flow Line-Diagram for Proposed Phase III

Prepared by: Pat Potts **Date:** October 8, 2008

ATTACHMENT 1

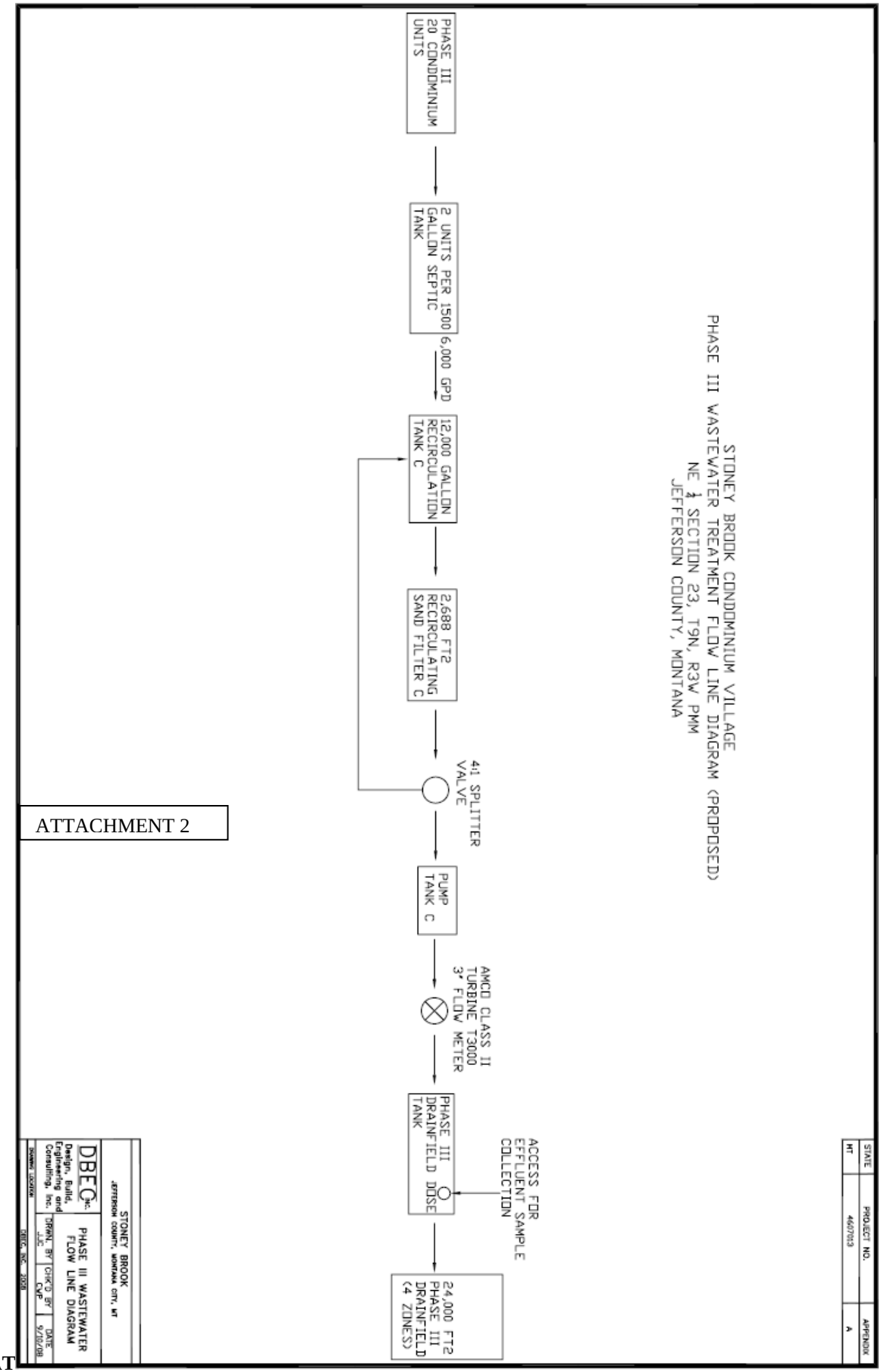
STONEY BROOK CONDOMINIUM VILLAGE
WASTEWATER COLLECTION SYSTEM FLOW CHART

LOCATED IN THE NW 1/4 OF THE NE 1/4 OF SEC. 23, T. 9 N., R. 3 W.
OF P.M.M., JEFFERSON COUNTY, MONTANA



C&H
Engineering and Surveying Inc.
1091 Stoneridge Drive • Bozeman, MT 59718
Phone (406) 587-1115 • Fax (406) 587-9788
www.chengineers.com • info@chengineers.com

#04834.2 WASTEWATER FLOW CHART



ATTACHMENT 2

ATAT